CLAIMS

1. A system for controlling blade tip clearance in a turbine, the system comprising:

a stator including a shroud having a plurality of shroud segments;

a rotor including a blade rotatable within said shroud;

an actuator assembly positioned radially around said shroud, said actuator assembly including a plurality of actuators;

a sensor for sensing a turbine parameter and generating a sensor signal representative of said turbine parameter;

a modeling module generating a tip clearance prediction in response to turbine cycle parameters;

a controller receiving said sensor signal and said tip clearance prediction and generating at least one command signal;

said actuators including at least one actuator receiving said command signal and adjusting a position of at least one of said shroud segments in response to said command signal.

2. The system of claim 1 wherein:

said at least one command signal includes a plurality of command signals; each of said plurality of actuators receiving a respective command signal to adjust a position of a respective one of said shroud segments.

3. The system of claim 1 wherein:

said stator includes an inner casing mechanically coupled to said shroud, said actuator assembly positioned radially around said inner casing.

4. The system of claim 1 wherein:

said controller derives an actual turbine parameter in response to said sensor signal;

said controller generating said at least one command signal in response to said actual turbine parameter.

5. The system of claim 1 wherein:

said modeling module generates said tip clearance prediction in real-time.

6. The system of claim 1 wherein:

said modeling module updates a model used for generating said tip clearance prediction in response to environmental changes.

7. The system of claim 1 wherein:

said modeling module updates a model used for generating said tip clearance prediction in response to engine degradation.

8. The system of claim 1 wherein:

said actuator includes a circumferential screw coupled to a drive mechanism, said command signal being applied to said drive mechanism to control rotation of said circumferential screw.

9. The system of claim 1 wherein:

said actuator includes a radial screw coupled to a drive mechanism, said command signal being applied to said drive mechanism to control rotation of said radial screw.

10. The system of claim 1 wherein:

said actuator includes an inflatable bellows in fluid communication with a pump, said command signal being applied to said pump to control pressure of said inflatable bellows.

11. The system of claim 1 further comprising:

a passive tip clearance control apparatus operating in conjunction with actuators to position at least one of said shroud segments.

12. A method for controlling blade tip clearance in a turbine having a blade rotating within a shroud having a plurality of shroud segments, the method comprising

obtaining a turbine parameter;

generating a tip clearance prediction in response to turbine cycle parameters;

generating at least one command signal in response to said turbine parameter and said tip clearance prediction;

providing said command signal to an actuator to adjust a position of at least one of said shroud segments.

13. The method of claim 12 wherein:

said at least one command signal includes a plurality of command signals, said providing including providing said command signals to a plurality of actuators to adjust a position of a plurality of said shroud segments.

14. The method of claim 12 wherein:

said obtaining a turbine parameter includes receiving a sensed parameter and deriving an actual turbine parameter in response to said sensor parameter.

15. The method of claim 12 wherein:

said generating said tip clearance prediction is preformed in real time.

16. The method of claim 12 further comprising:

updating a model used for generating said tip clearance prediction in response to environmental changes.

17. The method of claim 12 further comprising:

updating a model used for generating said tip clearance prediction in response to engine degradation.